‘Training the next generation of professional beekeepers’

Plan Bee

Module 3

Honeybee health and diseases

Developed by CIVIC

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Spey Valley Bees

Module 3

Introduction

There are a number of pests and diseases in Europe which may threaten honeybees. Beekeepers should be able to recognise common bee diseases and parasites and to differentiate the serious diseases from the less important ones in order to take the appropriate actions. This module will acquaint the participant with the common pests, parasites, and diseases and with techniques to prevent, diagnose, and treat them

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Module 3

Description

Module 3 introduces the most common diseases that affect bees as well as ways to prevent, diagnose, and manage them in order to keep bees healthy and safe. Module 3 will give you a thorough overview of diseases affecting honeybees and of disease prevention and management. Moreover, it will help you to keep your colony safe and thriving.

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Module 3

List of Topics

Topic 1 Common diseases and pests

Topic 2 Disease prevention and keeping the beehives healthy

Topic 3 Integrated Pest Management (IPM)

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Module 3

Learning Outcomes - Knowledge

Once you have completed this module, you will :

- Know about the most common diseases affecting honeybees, their signs and symptoms.
- Understand the ways to prevent a disease outbreak.
- Understand the ways to keep your bees healthy.
- Understand the actions to be taken for each disease.

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Module 3

Learning Outcomes – Competences & Skills

Once you have completed this module, you will be able to:

- identify the different diseases and their symptoms.
- diagnose the disease your bees may be infected by.
- take the necessary actions to keep your colonies safe and healthy.

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Topic 1 Common diseases and pests

Learning Outcomes

In this topic you will learn about the most common diseases and pest that may affect your bees.

Once you have completed this topic, you will be able to:

- Identify the symptoms and the signs of the diseases.
- Identify the appropriate treatment

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Topic 1 Common diseases and pests

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VARROA

ACARINE

AMOEBA

NOSEMA

VIRUSES

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Topic 1 Common diseases and pests

VARROA

Varroa, a species of mite, are very small red-brown external parasites of honeybees. They can be seen with a naked eye as a red spot on the bee.
Varroa mites mainly feed and reproduce on larvae and pupae and they cause weakening and malformation.
Varroa mites are also responsible for the transmission of several viruses.

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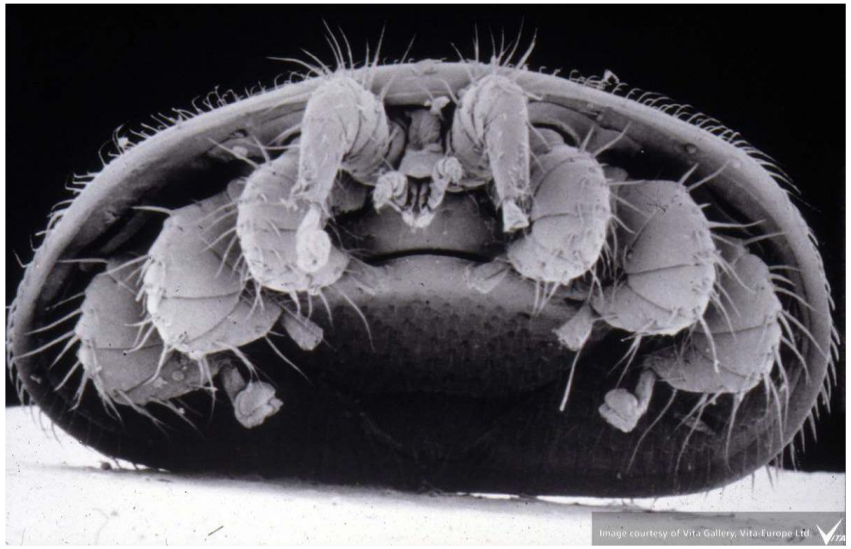
Topic 1 Common diseases and pests

VARROA

The varroa mites as parasites need a host to live and reproduce. They prey on adult bees and brood, but they only reproduce in the sealed brood cells.



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Topic 1 Common diseases and pests

VARROA

Varroa can easily move between bees
within the hive and infect the healthy bees of the hive.

Additionally, they can move to other colonies. This can happen if bees rob an infected colony, if bees drift from infected colonies to healthy ones, and through swarming.

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Topic 1 Common diseases and pests

VARROA

Signs of varroa infection:

- Scattered, neglected, discoloured, or chewed out brood
- Crippled bees
- Reduced lifespan
- Reduced weight
- Dramatic decline in adult bee population

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Topic 1 Common diseases and pests

VARROA

There are a number of chemical and mechanical treatments to control and treat Varroa mites.

For example some of the chemicals used are: Amitraz, fluvalinate, thymol, sucrose octanoate esters.

The mechanical treatments include methods that disrupt a part of Varroa's lifecycle. For instance, drone brood sacrifice, powdered sugar dusting, and brood interruption.

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Topic 1 Common diseases and pests

ACARINE

Acarine is caused by '*Acarapis woodi*', a parasitic mite, that gets into the tracheae of the bee through its breathing holes. Tracheal mites are oval and of translucent-white colour.

It was first discovered by Rennie in 1921. He believed it to be the cause of the 'Isle of Wight' disease that killed many colonies of managed bees in the UK and Ireland, but this has been disproved. A virus Chronic Bee Paralysis Virus, only discovered in 1961 was the actual cause and the signs and symptoms are often stated for both.

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Topic 1 Common diseases and pests

ACARINE

There no visible external signs of acarine. Microscopic examination of the first thoracic Trachae is needed to confirm the infection. The trachea of infected bees is discoloured.

Symptoms of the disease include:

- Large number of crawling bees
- Large number of dead bees on the entrance of the hive
- Disjoint wings
- Bees are unable to fly

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Topic 1 Common diseases and pests

ACARINE

Signs of Acarine include:

- No visible external signs.
- Some suggest crawling bees unable to fly, bees with disjointed wings (called ‘K wing’)
- Diagnosis can only be confirmed by dissection and microscopic examination of the first thoracic trachae
- When the disease is present the trachae will be discoloured and not the normal creamy colour of healthy adult bees

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Topic 1 Common diseases and pests

ACARINE

This is a contentious issue. It shortens the life of the bee and colonies can suffer with ‘spring dwindling’ as the lifespan of winter bees is reduced and the colony fails to build up. Additionally, blocked tracheae may affect the bees flying ability.

D. Bailllie

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Topic 1 Common diseases and pests

ACARINE

Treatments:

- Acarine disease is currently very rare as the use of varroacides to combat varroa seem to have also killed the tracheal mites.
- There are no chemical treatments.

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ACARINE

Acarine is often confused with CBPV as the signs and symptoms stated for Acarine are the same as those for CBPV. Certainly there have been deaths of colonies with the above signs that microscopic examination has shown were heavily infested with the mite (80%). But, it is still unknown whether the deaths of those colonies were due to the mite, CBPV, something else, or a combination of things.

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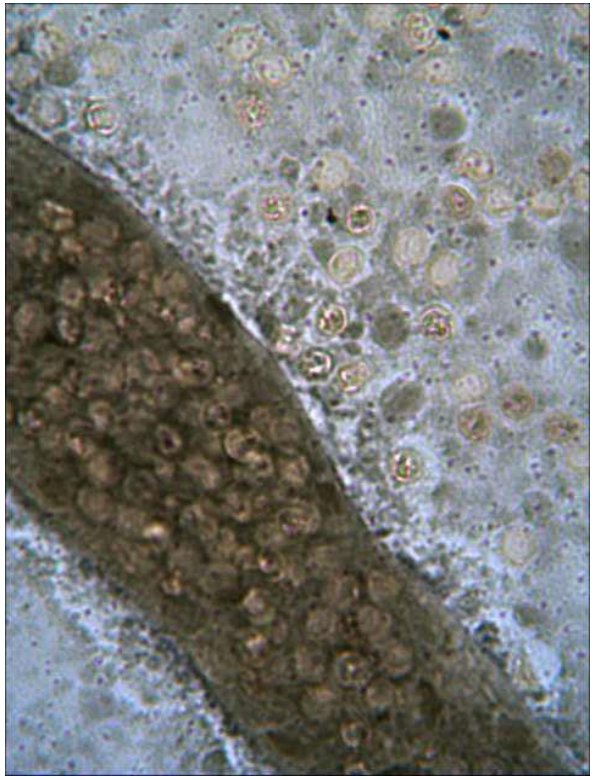
Topic 1 Common diseases and pests

AMOEBA

Bees are prone to be affected by amoebiasis, a disease caused by *Malpighamoeba mellificae* ~~is~~ a single celled parasite. Amoebiasis affects excretory organs of adult bees and can lead to death. Impact is believed to be low.



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Topic 1 Common diseases and pests

AMOEBA

The disease is transmitted through cysts constructed by the amoeba. Cysts are ingested accidentally by the bee. The amoeba passes into the Malpighian tubules and attaches to the lining. After 24 hours new cysts are formed which detach and pass to the rectum. The disease is passed to other bees in the hive through the food given to the larvae or through faeces.

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AMOEBA

Worker bees are the ones affected by amoeba. Diagnosing the disease needs laboratory examination. The Malpighian tubules should be removed to diagnose the parasite.

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NOSEMA

Nosema disease is caused by a species of microsporidian parasites called *Nosema apis.* The parasite multiplies in the ventiriculus and impairs the digestion of the bee for the rest of their life.

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Topic 1 Common diseases and pests

NOSEMA

Bees get infected when they ingest spores of *Nosema apis*. The parasite germinates within a few minutes inside the bee's stomach. There they multiply rapidly and form new spores (30 - 50 million) using the cells of the stomach lining as its food supply. Many of theses spores pass through the intestines and can be found in the faeces of the host bee, where they can remain active for up to 1 year.

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NOSEMA

The spores are spread through contamination of foodstuffs.

Spores remain viable for

- 1yr in faeces
- 4yrs in larval remains
- 4 months in honey

Confinement of bees in the hive due to poor weather is again thought to be a factor!

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Topic 1 Common diseases and pests

NOSEMA

There no visible signs of the disease. Microscopic examination is needed for the diagnosis.

The symptoms include:

- Shorter lifespan
- Dead bees near the hive entrance
- Reduced feeding of the brood
- Colonies fail to build up in spring
- Ovary degeneration & reduced laying in queens
- Reduced feeding of brood
- Signs of dysentery may be evident, i.e. soiled combs and entrance (diarrhoea) and dead bees outside
- Can lead to demise of colony

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Topic 1 Common diseases and pests

NOSEMA

Treatment and control of Nosema mite includes:

- Placing bees into a new comb
- Good beekeeping practices that prevent the spread of infections, e.g. no squashed bees, prevention of robbing/drifting, reducing stress
- Disinfecting infected combs and hive parts with 80% acetic acid

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Topic 1 Common diseases and pests

DYSENTERY

This is a condition not a disease and is caused by excess water in the intestine of the bee which manifests itself mainly in the winter due to any of the following:

- Unripe honey and/or late feeding of syrup
- Granulated stores
- Feeding brown sugar, raw sugar and acid inverted sugar
- Possibly wintering for long periods solely on heather honey
- A due to fermenting stores

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Topic 1 Common diseases and pests

DYSENTERY

Severe dysentery cases in bad weather can kill a colony. This is more likely to happen because bees are so weakened they succumb due to viral infections.

Dysentery treatments include:

- feeding thick warm syrup
- Bailley comb change in spring

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Photo: T. Harris

Photo: T. Harris

Photo: R. Lettey

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VIRUSES

Bees can also get affected by virus. Viral diseases can bring serious economic losses for the beekeeper especially, if there are associated with other bee diseases, such as varroa destructor. Varroa is a passive carrier of viruses which they transmit to the bees they infect. The parasite weakens the immune system of the bee making the them more vulnerable to viral infections.

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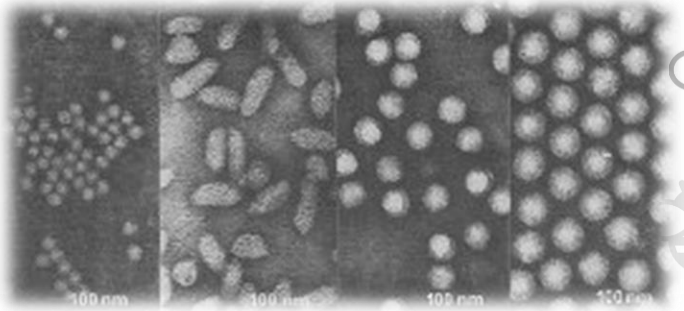
VIRUSES

- A virus is a bundle of genetic information, DNA or RNA with a protein coat.
- Viruses are unable to survive outside a host and in order to reproduce they hijack the host cells intracellular equipment.
- Honey bees are particularly vulnerable to virus infections.



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Topic 1 Common diseases and pests

VIRUSES

Viruses are too small to be individually visible under a normal light microscope and have to be viewed under an electron microscopes with a x30,000 magnification.

Molecular analysis techniques is required for positive identification and this is often not done, leading to the confusion between Acarine disease and CBPV.

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VIRUSES

Some of the more common bee viruses are:

- Deformed Wing Virus (DWV)
- Sacbrood
- Black Queen Cell Virus (BQCV)
- Chronic Bee Paralysis Virus (CBPV 1 & 2)
- Acute Bee Paralysis Virus (ABPV)
- Cloudy Wing Virus

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Deformed Wing Virus (DWV)

The DWV is transmitted via the mite Varroa destructor.

Symptoms include:

- Crumpled and/or vestigial wings
- Bloated abdomens
- Stunted adults
- Greatly reduced lifespan

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Sacbrood Virus

The Sacbrood virus affects mainly worker larvae. They get infected by eating brood food contaminated with the virus. It is most evident during spring and early summer.

Symptoms include:

- Uneven brood pattern (discoloured, perforated, or cappings)
- Larvae cannot dissolve the final larval skin
- Dying larvae leaving a dark brown flattened scale shaped like a ‘gondola’ or ‘Chinese slipper
- Bees stop eating pollen and become foragers earlier

The dark brown flattened scale is shaped like a ‘gondola’ or a ‘Chinese slipper

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Black Queen Cell Virus (BQCV)

Black Queen Cell Virus is a viral disease among honeybees.
The BQCV is associated with Nosema disease and is observed more in large queen rearing operations. Bees affected by Nosema apis, are more likely to contract the virus. It often affects commercial queen raising operations

Symptoms include:

- Queen cells becomes dark
- Larvae turn yellow and then brown/black
- Pupae's skin becomes sac-like
- Queens die in cell as pro-pupae

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Chronic Bee Paralysis virus

Although CBPV infects mainly adult bees, the virus can also infect younger bees. There are two types, type 1 and type 2.

Symptoms for type 1 include:

- Bees are unable to fly
- Bees crawl on the ground
- Bloated abdomens
- Disformed wings
- Dysentery and inability to feed

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Chronic Bee Paralysis virus

Symptoms for type 2 include:

- Bees are unable to fly
- Bees look darker
- They loose their hair
- Trembling

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Chronic Bee Paralysis (type 2)

- These bees are known as ‘little robbers’ or ‘black bees’ as they lose their hair – it is bitten off by other bees
- Dark in colour/greasy sheen
- Rejected by other workers
- Within a few days begin trembling, unable to fly and die
- Colonies can recover

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Photo: T. Harris

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Photo: T. Harris

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Video: T. Harris

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Acute Bee Paralysis Virus (ABPV)

It is a viral disease that is transmitted by Varroa.
There no visible signs of Acute Bee Paralysis Virus on the infected bees. The disease is fatal, pupae and adult bees die within 3 to 5 days.

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Cloudy Wing Virus

It is also transmitted by the mite Varroa.

Symptoms include:

- Opaque, white wings
- When at low levels the bee can be asymptomatic
- Shorter lifespan

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Topic 1 Common diseases and pests

Summary

- Bees can be affected by a variety of parasites and viruses
- Many of the diseases are not visible and need laboratory examination to be diagnosed
- Many of the diseases can be fatal for the bees

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Topic 1 Common diseases and pests

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Topic 1 Common diseases and pests

Extra Resources

1. Video on common bee diseases and pests: https://www.youtube.com/watch?v=Jd5FUJ1qDAo
2. UN's report on good beekeeping practices: http://www.fao.org/3/i9466en/I9466EN.pdf
3. Video on CBPV by Tony Harris

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Learning Outcomes

In this topic you will learn ways to prevent diseases and keep you bees healthy.

Once you have completed this topic, you will be able to:

- Identify good beekeeping practices
- Take the appropriate actions to keep your hives safe and healthy

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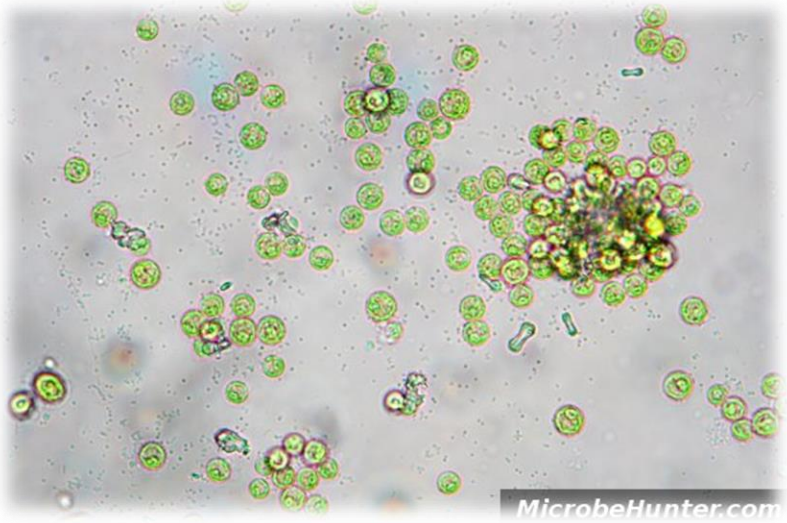
Why is Hygiene important?

Hygiene prevents the spread of diseases and helps you keep you colony safe and healthy.



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Risk factors for Spreading Disease

What are the greatest risks of spreading Diseases?

- Transferring brood or honey combs between hives
- Leaving wet combs out to be cleaned by the bees
- Contaminated clothing or gloves
- Feeding honey as it causes great excitement, can encourage robbing and can containing bacterial spores
- The health status of swarms is unknown
- Buying bees from unknown source

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A sterilising solution

A solution you can use to sterilise your tools:

Mix: 200 gm soda crystals, 1 litre of water, and a few drops of washing up liquid.
Keep the solution and your tools in a bucket

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You should clean regularly:

- Hive tools
- Uncapping forks
- Smoker
- Bellows (use parcel tape)

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Personal Hygiene/Safety

- Wear clean clothing and gloves
- Best to use disposable nitrile gloves
- Sterilise tools/smoker before and after inspections
- Wear safety boots or wellies with a steel toe-cap in case you drop a heavy super on your foot

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Apiary Cleanliness

- Your apiary should have hard standing or cut grass and ideally your hives will be on hive stands to allow a good circulation of air around as this prevents damp
- Don’t spill wax, honey, syrup on floor as it encourages robbing
- Use a bucket to collect and remove debris from the hive when inspecting
- When planning the apiary, make sure there is space around hives to work in safely

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Hive Hygiene

ALWAYS KEEP CLEAN THE:

- floors
- brood/super boxes
- queen excluders
- feeders
- drawn comb

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During inspections don’t crush bees as this can spread spores and bacteria around the hive.

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A good practice is to change 3 brood combs annually and to mark the top bar of the frame with the year it was introduced

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Why Change Brood Combs

Changing brood combs removes:

- disease pathogens
- virus build up
- chemical contamination
- damaged combs and frames
- Unusable/excess stores
- Provide space for queen to lay

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10 Commandments of Apiary Hygiene

- Always keep the apiary clean and tidy
- Never throw propolis or brace comb on the ground; be sure always to place it in a suitable container and remove it from the apiary
- Never buy old combs as it may be diseased
- Never buy colonies of bees unless it is known that they come from disease free apiaries; never accept stray swarms from unknown origins
- Always disinfect second hand hives and other equipment before use
- Never feed honey or allow bees to gain access to it; refined sugar is the only acceptable feed for honeybees

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10 Commandments of Apiary Hygiene

- If a colony dies out during the winter (or at any other time) and the trouble is not due to starvation, close the hive, pending the examination of a sample comb and bees, to prevent the remaining stores being robbed out
- Never exchange brood or super frames/combs between one colony and another unless it is known that all colonies are free from disease. Where possible, supers should be marked and always used on the same colonies

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10 Commandments of Apiary Hygiene

- Take care to prevent robbing at all times and do not spill syrup or have leaky feeders
- Arrange all hives in such a way that drifting is reduced to a minimum by facing the entrances in different directions

It is also recommended that you renew combs in the brood chamber once every three years on a rotational basis as this is another way of getting rid of disease pathogens

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Prevention is the best form of treatment. Keeping your beehives healthy is crucial for sustainable beekeeping and there are various ways to achieve that. As a beekeeper you should identify and adopt measures to prevent the entry and spread of dangerous parasites and viruses into your hives and thus protect your bees as well as your business.

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Know the signs

It is important that you know the signs and the symptoms of local and exotic bee diseases and pests in order to spot any changes early on. Make sure you are well informed on the common diseases of your areas as well as of more rare ones.

Look for online resources or any formal or informal, private or public trainings that you can participate in. Also, provide training on apiary biosecurity to all your staff members. Note: Be careful of online resources from the USA as their beekeeping methods are very different from that in the EU

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Regular checks

Performing regular checks on your bees and beehives is an integral part of sustainable beekeeping. You should perform the process regularly but not too often to disturb the routine of your colony.

Checking your hives every 7 days during the spring and summer seasons is recommended. In case you spot any unusual signs or conditions consult an apiary inspector. You should carry out an inspection of your hives, specifically looking for disease in the spring and in the autumn

Also, you should submit samples, bees, and brood combs for laboratory analysis regularly. Especially if you detect anything suspicious.

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Moveable Frame hives

Keeping the bees in moveable frame hives allows the brood area to be checked regularly for diseases.

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Clean equipment

Keeping your equipment clean and sterilised is important for having a healthy colony.

Before starting to work on each apiary, make sure that smokers, tools, and other equipment are clean of wax, propolis, or honey. Clean your extracting machines and containers before and after you use them.

Clean well inside out, dry, and then seal honey containers before you use them.
Don’t forget to always wear a clean bee suit.

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Clean equipment

In case you buy second hand equipment and colonies make sure that it's from a reputable supplier.
Examine the bees before buying to make sure they meet the required health standards.

If possible, keep the new colony isolated for a few months.

Lastly, before you use the newly purchased equipment sterilise it properly.

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Re-queen

Re-queening the beehives regularly (every 1-2 years) can prevent the colony from becoming weak and eventually dying. Having a strong hive can stop the development of pests and diseases. If your hive is weak then it may allow bees to rob them and thus bring diseases into the colony.

Ideally, you should select queens that show resistance to diseases, high productivity, and a low tendency to swarm.

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Feeding

Some good practices regarding feeding are:

- Avoid feeding the bees with honey, instead use candy or glucose/fructose syrup.
- Always verify the origin and quality of the food supplied to the bees.
- Another good practice is to feed the bees directly instead of using open or barrel feeding.
- Avoid feeding the bees with honey.
- Feed in the evening when the bees have ceased flying
- Don’t spill syrup on the floor as this can encourage robbing

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Other good practices

- Do not transfer honeycombs from one hive to another if you are not certain of the health status of the colonies.
- Give your bees only medicaments that are registered and certified.
- In case you spot any anomalies refer to an expert for help.
- Replace comb on a regular basis (at least every 3 years).
- Prevent or control swarming to reduce the spread of disease.

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Summary

- Prevention is crucial in keeping your bees safe and healthy
- There is a variety of good beekeeping practices to keep your bees healthy

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Extra Resources

1. Report by the The Honey Bee Health Coalition on how hive health:https://honeybeehealthcoalition.org/wp-content/uploads/2019/01/HBHC_Hive_BMPs_v1.0_reduced.pdf
2. Video on how to keep your bees healthy: https://www.youtube.com/watch?v=D2aLNqUq39g

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Topic 3 Integrated Pest Management (IPM)

Learning Outcomes

Once you have completed this topic, you will be able to:

- Understand what IPM is.
- Identify the different elements of IPM.
- Know how to apply IPM on your colonies to manage pests and diseases.

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Topic 3 Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is an approach that aims to control pests so they cannot cause significant harm to the colonies. IPM integrates a combination of controls, applied at different times of the year, keeping chemical input to a minimum.

According to UN's Food and Agriculture Organization IPM is "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms"

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IPM is an ecosystem-based approached and it aims at long-term prevention of pests and their damage. This long-term strategy recognises that complete elimination of pests is not feasible. Beekeepers should take actions to keep their bees as healthy as possible. Keep in mind that sick or dead bees are a threat to neighbouring hives as well.

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IPM strategy does not rely just on chemical approaches but uses multiple solutions.

In IPM chemicals and pesticides are used only after monitoring indicates they are needed. The main goal is to remove only the target harmful organism. Any materials used are selected and applied in a way that reduces risks to bee health, humans, other beneficial organisms, as well as the environment.

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Plan Bee

The 4 main elements of IPM are:

- Have a good knowledge of pests and diseases and their symptoms.
- Monitor your colonies for suspicious signs
- Use pest thresholds to identify when you need to intervene.
- Implement the right solutions to deal with each pest and disease.

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The foundation of IPM is **prevention**.

Prevention includes choosing bees with stronger genetics, using natural predators for biocontrol, and creating the appropriate environmental factors.

When prevention doesn't work and your bees are affected you start treating. Treatments can be chemical, mechanical, or a combination. In IPM, you start with treatments that are gentle to humans and the bees.

In case that doesn't work, you increase the strength of the treatment. At all times, you should monitor closely the colonies.

This method of intervening when it's necessary and using a combination of methods can reduce the development of resistance in the target pests.

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Plan Bee

First line of defence in IPM:

- Good husbandry should be a starting point for IPM control of Varroa.
- Keep a close eye on the health of your bees, and in particular make sure you can recognise the signs of Varroa infestation.
- Maintain apiaries to minimise the effects of robbing and drifting by facing hive entrances in different directions and leaving space between hives
- Aim to keep strong vigorous colonies and try to select strains that seem to show some Varroa tolerance.

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Managing Varroa

IPM is an effective strategy for treating varroa mite, a common threat to bees' health. There is a variety of strong chemical to treat the mite, however the overuse of some chemicals has led to the mite developing resistance and thus making some treatments ineffective.

On the contrary, using IPM helps the beekeeper gain a good understanding of the disease while preventing the mite from building resistance to strong treatments.

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Managing Varroa

Some of the IPM methods used to manage varroa are:

- Cultural controls: the least invasive methods that include practices to keep the bees healthy such as comb culling.
- Mechanical methods: a bit more invasive, they include drone brood removal.
- Chemical methods: they are used in case the varroa populations exceed economic thresholds. These include Apistan, and Apivar.

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Managing Varroa

The key to varroa IPM is measuring mite loads on a regular and timely basis so that you know when something needs to be done instead of simply treating prophylactically on a seasonal basis. The following methods are used to monitor:

- Open mesh floor with monitoring board
- Sugar shake
- Alcohol wash
- Uncapping drone brood

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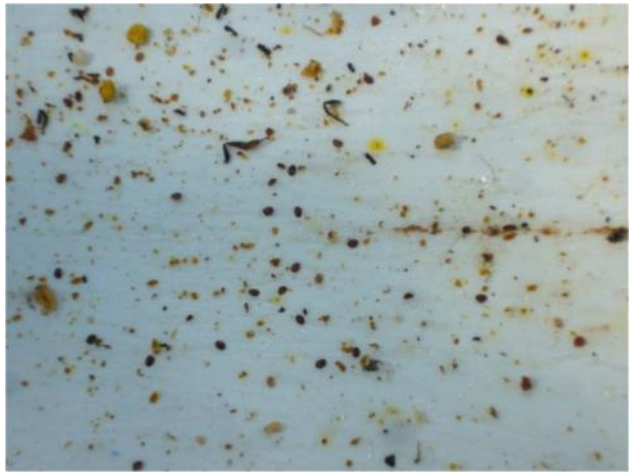
Open mesh floor with monitoring board

- Use before any treatment
- Insert board for 7 to 14 days
- Count mites, divide by no. of days
- Daily mite drop
- Calculator on Beebase website



http://scientificbeekeeping.com

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Sugar Shake

- Place 300 nurse bees (half a cup/100ml) and 2 tbs icing sugar in a jar with mesh lid
- Roll jar to cover bees in sugar
- Leave to stand for 5 minutes
- Shake upturned jar into white bucket of water for 1 minute
- Count mites
- Return bees to hive

http://nihbs.org/ireland

MONTH	May	August
Treatment level	More than 2%	More than 3%

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Alcohol Wash

The Alcohol Wash method is similar to the sugar shake method in that 300 bees are tested for varroa but as the alcohol kills them, they are not returned to the hive. The bees are soaked in alcohol and double sieved with running water allowing any dead mites to be counted. Treatment levels will be the same as for the sugar shake method.

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Drone Brood Uncapping

- Sealed drone brood (pink-eyed)
- Use uncapping fork to lift out at least 100 pupae
- Varroa mites are clearly visible
- Calculate percentage
- If more than 5-10% it is serious and immediate treatment is required

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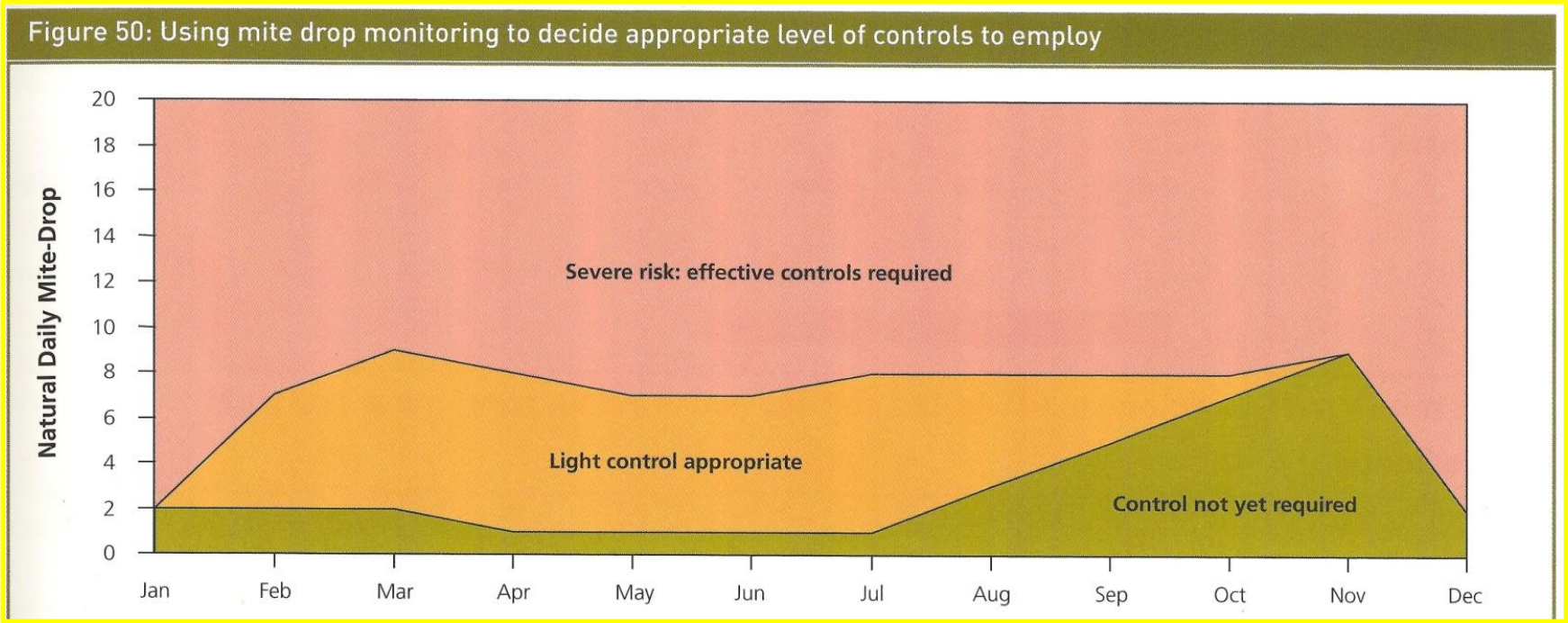
Mite Level Monitoring



Courtesy of NBU

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Varroa treatments

Biotechnical control reduces mite population by physical means based on bee husbandry. It also:

- Slows mite population growth delaying the damage to the colony
- Enables less effective but alternative treatment
- Necessity for treatment delayed by:
  - Late crops
  - Heather
  - Himalayan balsam

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Varroa treatments

Examples of biochemical controls are:

- Open Mesh Floors
- Sugar/flour dusting
- Drone brood removal/culling
- Queen Trapping
- Artificial Swarm
- Shook swarm

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Topic 3 Integrated Pest Management (IPM)

Varroa treatments

Examples of biochemical controls are:

- Open Mesh Floors
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- Shook swarm

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Open Mesh Floors

- Open mesh floors were originally designed to give ventilation. Now they can help with varroa control
- Research shows 20% mites fall through within 3 days of emergence and are unable to re-enter hive
- Hive must be on an open stand
- Lower mite population enter cells
- Not sufficient control on its own

Photo: Richard Ball

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Sugar Dusting Bees

- Icing sugar sticks to the footpads of phoretic mites and they fall off
- Use with open mesh floor
- Research papers show differing results.....
- 30 – 50% effective (Randy Oliver)

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Drone Brood Culling

- Because varroa mites prefer to reproduce in drone brood, removing it when it is capped makes sense as the breeding varroa are removed at the same time
- Operate when drone brood appears
- April to July
- Add short super frame to brood box
- Or full, starter strip
- Bees draw drone brood

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Drone Brood Culling

When capped, cut off and kill the drone brood. Repeat at 9-day intervals. The frame can be reused immediately.

Care must be taken not to deprive the colony of drones when they are needed. Although drones main function is to mate with virgin queens, they may well have other functions not yet determined. Certainly they play a role in temperature regulation just as the workers do.
Do not let drone brood emerge or the varroa population will increase as it will have allowed varroa to breed.

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Drone Brood Culling

This is an easy manipulation for everyone and requires no special equipment.
The colony tolerates the removal of drone brood well under normal circumstances.
One huge benefit is that it uses no chemical.
BUT
It is a time-consuming operation with limited results. Still, it is another weapon to help reduce varroa population increase.

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Queen Trapping - April-July

Another technique which has excellent results is the of trapping the queen in the months April to July. The varroa are enticed into brood and culled as follows.

The queen is confined to one empty drawn brood frame which is placed in a special outer frame – see below. This is put into the colony in the middle of the brood nest but as it is wider than a normal frame, it may be necessary to organise frame spacings with a dummy board. This first frame is marked to identify it.
After 9 days, she is moved to a second empty drawn frame. At this stage the colony must be inspected for queen cells as the bees may respond by attempting to raise a new queen. Any found are destroyed.

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Queen Trapping - April-July

The first frame is left in the hive for a further 9 days, making a total of 18 days. After 18 days, the first frame is destroyed or the wax reclaimed.
The procedure is repeated for the second and third frames, marking them for identification, although there is no need to inspect for queen cells as the only available larvae are on the frame with the queen. She is released and returned to the colony when she has been confined to the third frame for 9 days. It is left to incubate for a further 9 days while the queen continues her normal life in the hive. It is important that the incubating bee larvae in the cells are not allowed to emerge. Varroa are trapped and destroyed.

The colony may still swarm so it must still be monitored for swarm preparations.

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Queen Trapping - April-July

Advantages:
This technique can be very effective, as much as 90%. No chemical treatment is applied. Although there is a loss of brood for a month it has been shown that high honey yields are still maintained. The workers have less brood to look after therefore more are recruited to foraging and the colony soon recovers its population strength.

Courtesy Thorne's beekeeping equipment

However:

- It is a time-consuming technique and good beekeeping skills are needed as it is a complicated method.
- It relies on exact timing of manipulations.
- There is a danger that it can harm or weaken the colony if used in the wrong season such as late summer

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Artificial Swarm

The artificial swarm is easy to adapt to reduce mite populations and you can do it at the same time as your swarm control. Here's how you do it.

Create the artificial swarm as you would normally with a spare hive a couple of metres to the side of the original site containing the brood frames from the original hive.

The queen is placed alone on the old site in a new brood box filled with newly drawn comb to which the flying bees return, creating the artificial swarm. A queen excluder is placed below the brood box to prevent the swarm from absconding and may be removed once there is brood on the frames.
After 9 days, the queen cells in the old brood box are culled except for one. This is enclosed in a queen cell cage to prevent the virgin from leaving the hive on her mating flights.

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Artificial Swarm

3 weeks later, all the brood in the original box has hatched.
The queen in the artificial swarm continues to lay so take 2 frames of unsealed brood and place in the old parent box, now broodless. Varroa mites are enticed into the open cells, and as soon as they are capped the combs are destroyed, thus culling the mites.
The virgin queen is destroyed and a new queen introduced to the old colony on its new site.
The original queen, now in the artificial swarm, is later removed and the two colonies re-united.

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Artificial Swarm

It is a highly effective method, up to 90% varroa removal, and combines normal artificial swarm technique with varroa control. A new queen is introduced to the colony, reinvigorating it and no chemicals are used.

However, this method is only suitable for the swarming season and a queen excluder should be placed between brood box and floor until new brood is capped for pheromones to deter the colony from absconding.

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Effectiveness

Open mesh floors plus drone culling are estimated to slow growth by 50%, and artificial swarm and queen trapping – which give the colony a brood break – can be as high as 90% efficient.
The overall aim is to use the minimum of chemical treatments.

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Shook Swarm

How many of you have performed a shook swarm before?

The Shook swarm needs to be performed with care, and the colony should be strong but is a good way to completely change brood combs and usually the colony develops well. Shown to produce vigorous colonies in spring

It also helps avoid swarming as the wax builders are busy. The brood break enables treatment of phoretic mites with oxalic acid.

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Shook Swarm

BBKA Course
in a Case

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2 days later

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Shook Swarm Aftercare

After a week, check that there is brood present and if so, remove the queen excluder. Leave for another week if not.
Keep checking and continue to feed until the frames are drawn, and move frames around to equalise them as bees find it hard to build wax at the end combs where there is less room for them to cluster when wax building.
Also check regularly that the colony has enough stores and continue to feed until it can support itself. This depends on the weather and what nectar flows occur.
About 5 kg of stores per week will be required.

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Shook Swarm

The advantages of the Shook swarm are that it reduces possible other diseases and is good hygiene practice as it replaces all brood comb in one operation

BUT

Good beekeeping skills are required, it is time consuming.

There is a risk that the colony will abscond. If the queen gets lost, the colony has no brood left with which to raise a new queen.

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Chemical Treatments

Beekeepers generally differentiate between so called hard and soft chemicals, i.e. synthetic miticides (hard) and those chemicals which are also found in nature (soft), e.g. formic acid, essential oils but this is misleading as many ‘soft’ chemicals are quite harmful in concentration, killing queens, bees and brood and can be dangerous to beekeepers, while synthetic treatments are not.

You will be familiar with selective breeding for better bees but if you are simply using miticides once or twice a year you have probably been breeding for ‘better mites’ that develop resistance to miticides, and build up quickly after a treatment.

Scientists generally agree now that the use of miticides in not a silver bullet in tackling varroa and continued use is adding to the problem. If we want to tackle varroa effectively, then maybe we need to cut out the use of chemicals and allow our bees to adapt to the mite like the Asian honey bee has.

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Chemical Treatments

Bayvoral and Apistan are synthetic pyrethroids and are used when there is no honey crop on the hive, by inserting strips into the brood chamber of the hive for a period of between 6 and 8 weeks . They are able to kill a high percentage of mites in the hive because they are time released or remain effective long enough to kill mites which are inside of capped brood at the initial treatment time.

However, synthetics may leave long-lasting / permanent residues in the hive – especially in wax. These residues seem to cause fertility problems for both queens and drones, and detractors speculate that they may be factors in long-term hive health problems. The mites have also developed resistance to these chemicals.

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Chemical Treatments

Bayvarol:
A synthetic pyrethroid. It was extremely efficient but acted on a particular synapse and so mites were able to develop resistance to it.
Dosage and use was the insertion of four strips into the brood box for a period of six weeks after which the strips were to be removed and disposed of. (Two strips for a nuc)
It is a contact poison and so mites within the cells were not affected, this is why the dose lasted for the six weeks as this is two brood cycles.
At this stage there is resistance to the chemical and it should not be used.
For anybody still with stocks of it, you should test for pyrethroid resistance before you use it

'Apistan'. Strips impregnated with tau-fluvalinate are inserted into the hive in late August or early September after the honey harvest has been removed for at least 6 but no more than 8 weeks. It is a highly effective treatment but pyrethroid resistant mites are now present in the U.K. including Scotland (and Moray) so Apistan may not work if you have resistant mites

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What is Resistance?

Varroa populations will eventually develop resistance to any chemical varroacide so that the treatment is no longer effective.
Initially a small number of resistant mites but due to selection pressure, resistant traits start to dominate.
This can happen when a population of mites is repeatedly exposed to a varroacide leaving more of the resistant mites alive to breed until resistant mites dominate.

Crown copyright: APHA

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What is Resistance?

How to avoid resistance?

- Treat as little as necessary
- Only apply dose specified
- Only treat for the period specified
- Use alternate treatments

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Apivar

Apivar is another varroacide that uses the chemical Amitraz to combat the mite, and it is impregnated on strips hung in the hive in a similar way to the use of Apistan. It paralyses the mite so varroa cannot keep holding on to the bees and falls to the bottom of the hive, leading to their starvation. Apivar is only available from a vet under prescription, and they have to import it under a licence known as the Cascade system.

Apitraz has replaced Apivar which is not to be used anymore, but Apitraz (active ingredient Amitraz), although approved by the UK Veterinary Medicines Directorate (VMD), is not yet available from Thorne. You will not need to obtain this from vets, it will be sold by beekeeping suppliers.

Hopguard, produced by Vita Europe, should be available later in the year as it has now been approved by VMD. This consists of acid from hop plants delivered in strips.

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Oxalic Acid

- Oxalic acid is a natural chemicaland is found in honey and carrots (carrots)
- It is safe, effective, cheap, and is not temperature dependent
- Causes little bee brood mortality
- It can be trickled in a sugar solution or sublimated
- Use during broodless periods (late Dec)

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Oxalic Acid - Api-bioxal

- Api-bioxal, was approved in 2015 and became the only approved oxalic acid treatment in the UK
- Powder not crystal – risk of inhalation
- Sublimation concerns – silicone gel
- £10 for 35g (10 hive size)
- New product, ‘Oxuvar’

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Trickling oxalic Acid

When trickling oxalic acid please follow the mixing instructions carefully as you can overdose the bees! Api Bioxal recommends trickling at a solution of 4.2% and there are concerns that this is too high – traditionally we would use a 3.2% solution.

You can use a syringe to apply and measure out the syrup but I actually use these trickle 2 bottles that measure out 5 ml into the cap so it is even easier to apply the correct measure. Another suggestion is to carry a thermos flask of hot water with you so you can warm up the solution before trickling it on the bees.

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Oxalic Acid Sublimation

- This is 97% effective and safer for the bees (Ratnieks)
- But not the beekeeper if inhaled!
- Tests have shown the highest colony survival 4 months later and 20% more brood in spring than trickling
- Can apply three treatments per year

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Other Varroa Treatments

Formic acid and Lactic acid are organic acids that can be used to tackle varroa and although they do occur naturally in honey, they are found in minute amounts and are hazardous to bees and beekeepers.

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MAQS Strips

- MAQS strips, active ingredient formic acid, is the only product that will kill mites in capped brood so it is a useful weapon to have in our armoury
- However, the strips can also kill queens, bees and brood so extra attention is needed
- Only use on strong colonies
- Only 1 treatment required – 7 days
- Daytime temp 10C to 32C
- Full ventilation is needed so ensure a full width entrance, consider adding an empty super to single boxes or even splitting the two brood chambers by moving the top one an inch or two to the side

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Example IPM Strategy

Control	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Open mesh floor												
Drone brood removal												
Comb trapping												
Queen comb trap												
Formic acid												
Apiguard												
Exomite Apis												
Apistan/Bayvarol												
Lactic/Oxalic acid												

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Overall Effectiveness

- 99% control: 94 days to reach 1,000 mites
- 90% control: 48 days
- 80% control: 35 days

- Beware of re-infestation!

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Medicine Record Card

Beekeepers must keep documentation containing details of veterinary medicinal products administered in colonies for at least five years, irrespective of whether or not the colony concerned is no longer in that keeper's possession or has died during that period. The following must be recorded:

- Name of product, batch number, date acquired, quantity and from whom
- Date of administering, quantity etc
- Date of disposal, how disposed etc

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Key Points

- Monitor your colonies regularly for varroa mites
- Co-operate locally so you all use the same chemical treatment to prevent resistance building up
- Practice IPM methods throughout the season
- Slow and minimise build-up by using bio-technical methods
- Only use authorised varroacides
- Rotate use so you are not using the same chemical year on year
- Only use in accordance with the manufacturer's guidelines
- Watch for resistant mites
- Keep up-to-date
- Select breeding stock

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Treatment free

- More and more beekeepers are reporting that they are “Treatment Free” and their bees are surviving so it appears there are strains of bee that do deal with the varroa mite better than others. This is probably genetic but the bees may be adapting to the mite as well.

- The essence of the treatment free philosophy is to not treat, let the hives which can’t hack it die, and then make increase from the remaining “Survivor” bees.

- An option may be to buy queens that have been part of a selective breeding programme or to select your queens for varroa resistance,

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Summary

- There is wide range of treatments for the different bee diseases.
- It is important to pick the right one for your situation.
- Overuse of chemicals can lead to mites developing resistance and thus making the treatment ineffective.
- Integrated Pest Management (IPM) is an approach that aims to control pests so they cannot cause significant harm to the colonies. It integrates a combination of controls, applied at different times of the year, keeping chemical input to a minimum.

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Extra Resources

1. Video on Varroa and IPM: https://www.youtube.com/watch?v=aFILPZ5KbgU

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Congratulations!
You have completed Module 3

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